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EXPERIMENTAL OBSERVATIONS ON THE Water of the Mineral Spring near *Iſlington*; commonly called *New Tunbridge Wells*:

TENDING,

As well to explain and illuſtrate the general Nature of Chalybeat Waters; as to demonſtrate, from an obvious Compariſon of its qualities with thoſe of the *Spa* and *Tunbridge* Waters, made by an accurate Examination, that it is abſolutely of the ſame Species with them, but greatly preferable, on Account of that advantageous Reduction of the Quantity it admits of, from its higher Impregnation, and the conſequent Increaſe of its Efficacy.

To which is ſubjoined,

An Account of its Medicinal Virtues and Uſe; and of the moſt adviſeable Methods of Drinking it in each Kind of Caſe.

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THE

PREFACE.

AFTER the ſanction, which an univerſal and long continued practice has given to the medicinal uſe of Mineral Waters, (eſpecially thoſe of the Chalybeat kind;) and that copious experience, which has prevailed on the moſt able Phyſicians to acknowledge the efficacy of them; it would be a needleſs labour to go about to prove their general excellence. That they may be accounted one of the moſt valuable gifts, which providence has beſtowed on us, will be denied by few; as ſcarcely any are ignorant, that, by their means, we may frequently obtain an eaſy relief in chronic diſtempers, the greateſt of thoſe evils to which the preſent nature of our Being renders us liable; and this, ſometimes, even when the force of medicines, hazardouſly violent, has been tried in vain. But if it be unneceſſary to point out and demonſtrate the already well-known benefits, that may accrue from judiciouſly drinking mineral waters; it may notwithſtanding be of important ſervice, to give a light into the method of diſtinguiſhing the genuineneſs of any, that are offered to the public. Nor leſs ſo, to inform the numerous inhabitants of London, *that their neighbourhood affords a chalybeat ſpring, equal, if not ſuperior, to any other with which the world has been hitherto made acquainted; and to add ſuch proof of the truth of the fact, from Obſervations and Experiments on the properties of water, (comprehenſible to any of moderate underſtanding) ſhewing its ſpecific* *affinity (or ſameneſs of kind) with others the moſt eſteemed; as together with the manifold inſtances of its actual virtue, in the cure of various diſeaſes, that will on proper inquiry be found to have occurred, may ſatisfy every doubt, and remove all ſcruples, which ſhall on any account have ariſen concerning it. The diffuſive communication of this truth, may probably be the means of a very eſſential good. It may furniſh a happy opportunity to many, whoſe ill or uncertain ſtate of health calls for the adminiſtration of ſuch remedies, of procuring that much wanted aſſiſtance, they might not otherwiſe imagine to be within the compaſs of their reach. It may enable thoſe, whom the fatigue or expence of journies may deter or hinder, the urgency of buſineſs prevent, or an attachment to their families withhold, from ſeeking them at a greater diſtance, to avoid the dangerous or fatal omiſſion of their uſe, by finding themſelves provided with one near at hand, on which they may aſſuredly rely; for that the waters of the Mineral Spring near* Iſlington, *commonly called* New Tunbridge Wells, *may be juſtly deemed ſo, none, who will take the trouble of examining the following contents, can have room to queſtion.*

It is not, however, that this medicinal treaſure has, till the preſent time, lain totally hid from thoſe, to whom it could afford ſuch material advantages. A great reſort, for many years, of invalids of all ranks, and labouring under a diverſity of maladies, evinces that juſt notion the public formerly entertained of theſe waters; and the attendance, as well of ſome people of condition, as others, by the advice of perſons of unqueſtioned merit in the faculty, ſhews likewiſe, there are not at preſent wanting thoſe who are ſenſible of their real value.

lue. But nevertheleſs a neglect of attention, ariſing from that caprice of mankind ſo common in matters of this nature; and certain prejudices againſt them, unfairly propagated, to anſwer ſelfiſh and ſiniſter ends, by perſons, ſome of them of note, in the ſeveral branches of the practice of medicine; have in ſome meaſure diminiſhed that reputation they have for many years held; and even greatly contracted the knowledge of the public with reſpect to every thing concerning them: whence doubtleſs many have been deprived of the effectual aid againſt the rage of calamitous or mortal diſeaſes, they might otherwiſe have happily received from them; and that without the torment of thoſe tireſome and nauſeous loads of medicine, with which patients under ſuch circumſtances are too often perſecuted.

As the belief of the ſalutiferous powers of chalybeat mineral waters has been too well confirmed, by a long courſe of experience, to be eaſily ſhaken, the method taken to decry the Iſlington *ſpring, has been by endeavouring rather to diſparage the particular merits of it, than to depreciate the kind: and indeed it ſuited much better with the views of thoſe, who have been moſt active in cultivating prepoſſeſſions againſt it, to arraign the pretenſions of its yielding genuine mineral waters, than to deny the virtues of ſuch when real; their final intention being, not to diſcourage the drinking of mineral waters in general, but only to give a preference to thoſe, in the vogue of which, they might, from ſome private connection, find their own account. It is to be feared, that theſe, however mean, are the true motives, which have induced ſome eminent Phyſicians, as well as others, to declare poſitively,*

poſitively, that the waters of this well are artificially medicated: an aſſertion, which when duly reflected on with the leaſt knowledge of the relative facts, cannot fail to appear as idle as wicked. But how perſons, who have a diſtinguiſhed character to ſupport, and depend on the confidence of the world in their probity and ſkill, dare venture to advance a falſity ſo glaring on the firſt view to ſome, and ſo eaſily confuted, by the leaſt explication, with all, I own, I am entirely at a loſs to account. If they really inquired into the circumſtances of the caſe, or attempted by any actual trials of the water to aſſure themſelves of the truth, it muſt be thought ſurprizing, that their ignorance of the ſubject ſhould be ſo great, as to make them fall into ſuch an enormous error; and yet more ſo, that, being no better qualified to judge of the matter, they ſhould riſque the detection of their want of knowledge, by avowing an opinion formed on a foundation thus defective. Or if, on the other hand, they wantonly alledged the thing, without any grounds at all of previous information, or from having taken up the notion on the credit only of ſome vague report, what ſtrange folly, as well as injuſtice, do they not ſeem guilty of, to venture to ſtake their judgement and veracity together, on the vain ſuppoſition of a point, that, taken in any rational light whatever, muſt ſeem improbable: nor can ever become a juſt article of belief, much leſs a fit one of peremptory affirmation, but through the force of ſome very authentic teſtimony of the fact itſelf, or of a clear induction drawn from ſome experimental reſearch, conducted on obvious and indiſputable principles. But however incredible the affair may ſeem, it is as certain,

tain, that reports of this kind have been induſtriouſly ſpread, and even by ſome Phyſicians of note, as well as other perſons, to the great detriment both of the public and the proprietor of theſe Wells, as that all ſuch are abſolutely falſe in every degree.

It is therefore peculiarly ſeaſonable at this time, to give a more ſuccinct and full account of the Iſlington *waters, than has been hitherto laid before the public, by which, (the correſpondence of their qualities with thoſe of other Chalybeat ſprings of the greateſt repute, being therein particularly made appear,) their abſolute, as well as comparative goodneſs, may be clearly diſtinguiſhed; and thoſe prepoſſeſſions againſt them removed, that may prevent the public from reaping thoſe benefits they might otherwiſe afford. And it may not be improper, to ſubjoin ſome ſuch remarks on the general nature of Chalybeat waters, whether natural or fictitious, as may ſhew even the impoſſibility of giving to any compounded by art the characteriſtics, which theſe in queſtion are found to bear. But beſides the good, that may be conferred on the people of* London *and its neighbourhood, by imparting to them juſt notions of the peculiar excellence of the* Iſlington *waters, I have endeavoured to afford another to the world in general, by diſplaying, in the moſt clear light the conciſeneſs requiſite in this ſmall tract would admit, ſome truths regarding all Chalybeat waters; which, though hitherto unknown or diſregarded, are yet well worthy, either on the motives of curioſity or uſe, of the ſtricteſt attention: as they both furniſh agreeable matter of philoſophic ſpeculation, and illuſtrate ſome very intereſting points of practice. And though, in this double view, I may poſſibly have introduced ſome things* *belonging to a branch of ſcience purſued by few, that may not be perfectly underſtood by the generality of thoſe, for whom the peruſal of this work is deſigned, yet as I have been careful to introduce them in ſuch a manner, as may prevent their throwing any perplexity on the reſt, I hope I may be excuſed for it by thoſe, to whom therefore their inſertion or omiſſion is alike indifferent.*

The Spa *and* Tunbridge *waters, holding the firſt rank among thoſe at preſent in eſteem, which owe their medicinal virtues ſolely to a Chalybeat impregnation, I thought it proper in my examination of the* Iſlington *water, to have a particular regard to its affinity with them: and I have accordingly made the ſame trials of them all, by the experiments that gave foundation to the following Obſervations, in which I ſhall faithfully note what the reſult preſented in relation to each. And this I have done, imagining it would be a more ſatisfactory method of manifeſting the genuineneſs of the* Iſlington *waters, to thoſe who are not converſant with ſubjects of this kind, to ſhew they are the ſame with the others of which the merits are indiſputed, than to attempt to demonſtrate it altogether on abſtract principles; in reſpect to which, the want of their being previouſly underſtood, would render the reaſonings drawn from them of little force with many. But to thoſe who are unaccuſtomed to ſpeculative diſquiſitions, there are nevertheleſs few things ſo abſtruſe in what I have advanced, as to prevent their comprehending them ſufficiently to render nothing more wanting to give them their due effect, than that attention which ariſes from a taſte for the ſubject.*

EXPERIMENTAL OBSERVATIONS ON THE Water of the Mineral Spring near *Iſlington.*

THE mineral ſpring, commonly called *New Tunbridge Wells*, (from its being of a ſimilar nature to that of *Tunbridge* in *Kent*) affords, as I ſhall make it appear below, a true *native* Chalybeat water of the *ſimple* kind; being totally free from any of thoſe cathartic ſalts, with which the *Scarborough*, and many other mineral waters are, beſides the ſteel, impregnate; and which render them therefore of a compound, and conſequently different nature, from the *ſimple*, as well in their medicinal operation, as in thoſe properties which are cognizable by experiments. The principal of the *ſimple* Chalybeat Waters, in reſpect to the preſent practice, are thoſe of the *Spa* and *Tunbridge*; of which the ſtrict affinity in all their diſcoverable qualities, with the water of the *Iſlington* ſpring, is one chief medium I ſhall uſe in demonſtrating this to be truly of that kind, the medicinal virtues whereof are ſo well confirmed by a long and general experience: and this view will, in the conduct of the following obſervations, be conſtantly preſerved.

The time when the *Iſlington* waters were firſt known as a remedy, is not to be certainly collected from any information I have hitherto met with: for the firſt written notice I have found taken of them, is in a treatiſe of Mr. *Boyle's*, publiſhed in 1684, wherein, amongſt thoſe of other mineral waters, he gives their ſpecific gravity; and from the circumſtances of the mention he makes of them, it may be gathered, that they had, before the time he wrote, occaſioned the place to be the ſeat of ſome public diverſions; and that there were then open three ſeveral heads to this ſpring; which, according to the expreſſion whereby he diſtinguiſhes them, were, one near the *muſic-houſe*, which I take to be that at preſent uſed; another *in the cellar*; and a third *in the vault with ſteps*; which two laſt have been for many years filled up: that which has been kept in uſe having been found to be preferable, as appears by this account of them; as they vary from common water in double the proportion to the other. That the place had * been in much the ſame condition long before his time, may be concluded from the pictures, furniture, and other particulars found in the long room, which carry marks of a date, at leaſt as early as the reign of queen *Elizabeth*. And this I think is one of the circumſtances, that reflect an abſurdity on thoſe, who are fond of the opinion of their being counterfei; it being ſcarcely poſſible that a fraud, which might at any time be ſo eaſily detected by experimental proofs, ſhould be ſo pertinaciouſly kept up, and impoſed upon the public for ſo many years.

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* It is obvious that this water was in public uſe, as a medicine, long before the very notion of fictitious mineral waters had been formed in *England*: for in the reign of king *Charles* II. ſir *William Jennings*, obtained a patent for the ſole making of ſuch waters, on the merits of having been the *firſt* inventor of them.

The moſt diſtinguiſhing and peculiar quality in the *Iſlington* waters, is their ſpecific gravity, (*or comparative weight with others*) which according to the account given by Mr. *Boyle* (* and verified by an examination lately made) is leſs than that of common water in the proportion, three ounces, four drams, and thirty-ſix grains, bear to three ounces, four drams, and forty-three grains; that is to ſay, the *Iſlington* water is lighter than common water, by ſeven in one thouſand ſeven hundred and twenty-three. The means made uſe of by Mr. *Boyle*, for diſcovering this difference, was by filling a glaſs of a proper form, to an exact height, with each kind of water, and then weighing it; on which trial of theſe, along with the mineral waters of ſeveral more *ſprings* †, they were found to hold the proportion here given.

Among

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* I made a trial of the ſpecific gravity of this water, with one of the beſt kind of Hydrometers, or *Water-poiſes*, now in uſe; but, indeed without expectation of finding the ſtate of the water ſuch at preſent, after a rainy ſeaſon of more than four months duration, as would ſuffer it to correſpond in abſolute fact with Mr. *Boyle*'s account. It is conſtantly apparent, to thoſe who have an opportunity of taſting it at ſuch times, that the peculiar flavour of the water is abated, even by common rains; and certainly the extreme wetneſs of the preſent ſeaſon, muſt have had proportionable effects, and greatly diminiſhed its ſpecific qualities. There was, however, enough difference found betwixt its weight and that of common water, to confirm the belief of a matter delivered on an authority ſo reſpectable; and in a caſe ſo ſimple and obvious, that nothing but a failure of the voucher's veracity could give occaſion to the falſhood.

† The waters Mr. *Boyle* examined by this method, and their reſpective weights, were as follows:

	oz.	*dr.*	*gr.*
Common water was found to weigh	3	4	43
Common water diſtill'd	3	4	41
Acton water	3	4	48½

Among the others, it appeared, that the *Tunbridge* water was lighter than common water, by 5 in 1723; and the *Spa* water by 3; and conſequently the firſt, than the *Iſlington* water by 2, and the latter by 4: the reſt which he tried being all of a ſaline nature, though ſome of them participating alſo of a Chalybeat impregnation, proved heavier in various degrees than common water.

As this remarkable * accident is found, in a greater or leſs proportion, to attend all *native* Chalybeat waters,

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	oz.	dr.	gr.
Epſom water	3	4	51
Dulledge water	3	4	54
Stratton water	3	4	55
Barnet water	3	4	52
North Hall water	3	4	50
The *German* Spa-water	3	4	40
Tunbridge water	3	4	38
Iſlington water from the muſic-houſe	3	4	36
Iſlington water from the vault with ſteps	3	4	39
Iſlington water from the cellar	3	4	39

* This appearance is, perhaps, as remarkable, and ſeemingly contradictory to the analogic laws of the ſubject, as any whatever that nature preſents: and though yet unattended to, affords as ample matter of curioſity. It being a paradox well deſerving the pains of a philoſophic ſolution, that water impregnated with ſo heavy a body as iron, ſhould notwithſtanding be rendered thence lighter than in its ſimple ſtate, and in ſuch a degree, that the defect is in a multiple proportion to the weight of iron any given quantity contains; but, however irreconcileable to the general analogy, or difficult to the conception, it may be found on an exterior view, a reaſon for this ſeeming breach may be diſcovered in a cloſer reſearch into the ſpecific properties of bodies, and the effects of their conjunct action. An acquaintance with the general powers and laws of cooperation of thoſe bodies, the experiments of chemiſtry teach us to regard as elementary, is indeed neceſſary to a thorough comprehenſion of this ſeeming deviation; but I ſhall have occaſion in the ſequel of this eſſay, to touch on ſome of the leading

ters, that are not of a *compound* kind, and them alone; and as it can be produced only by nature, there being, for reaſons we ſhall have occaſion to explain hereafter, no practicable method of producing it by art; it affords an infallible mark of the genuineneſs of thoſe in which it is found. And as the proportion of the variation from common water, in this point, in the water of each ſpring, muſt be ſuppoſed correſpondent to that of the medicating ſubſtance, with which ſuch is charged, it gives likewiſe the means of determining the quantity of the impregnation: whence a double end may be obtained by this method of trial of Chalybeat waters; "the proof of their being of the right ſpecies, and the meaſure of the comparative ſtrength, or degree of medicinal power they bear to each other." This being granted, it amounts to a full demonſtration, that the *Iſlington* water, which has this quality in a degree beyond any other hitherto known, muſt be of the genuine and true kind: and alſo, that as it exceeds the others in this point, it muſt be allowed to excel them; its medicinal efficacy being thence, by a neceſſary inference, argued to be ſuperior. I do not, however, mean, that it is indued with any diſtinct virtues or powers, which they are totally deſtitute of; but that poſſeſſing the ſame in a greater degree, a leſs quantity will ſuffice to work an equal effect. An advantage of the utmoſt importance in many caſes, the great load of water, taken in ſuch a proportion as carries enough of the medicinal matter to conſtitute a proper doſe, being frequently diſagreeable to the bowels; and in ſome inſtances of very injurious conſequences. And indeed this is ſo much the caſe in mineral waters which operate by purging, that it is a reaſonable queſtion, Whether it be not always better to take an artificial ſolution of cathartic ſalts, than to ſwallow ſuch monſtrous draughts

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ing principles, in a manner, that may poſſibly yield ſome ſatisfactory notions concerning it, even to ſuch as are ſtrangers to theſe ſubjects.

draughts as are required of this kind, to produce the intended effect. This objection does not however avail in the ſame high degree, even in the caſe of the weaker Chalybeat waters; but is intirely obviated, in regard to that of the *Iſlington* ſpring, by its extraordinary ſtrength; for the fit quantity to be taken is ſo moderate, as not to ſubject thoſe who drink it, in the leaſt, to this inconvenience: and indeed it is very happy, that the fact is ſo, for thoſe who have occaſion for this kind of remedy; as no ſubſtitution of an artificial preparation of ſteel can be made in the ſtead of the true mineral Chalybeat water, either in a fictitious Chalybeat water or any other form, with adequate effects; as I ſhall below take an opportunity of explicitly ſhowing.

The taſte of the *Iſlington* water is the ſame with that of all other things which receive their flavour from iron; but it is only in a ſmall degree *ſtyptic* or *auſtere.* It reſembles exactly, when diluted with proper quantities of pure water, to reduce it to an equal ſtrength, the *Spa* and *Tunbridge* waters: and even in this point there is a ſenſible difference, though ſuch as may, perhaps, eſcape thoſe who are not beforehand apprized of it, betwixt the *natural* Chalybeat water, and any *artificial* ſolutions of ſteel; in all which, an acid muſt neceſſarily be uſed, and give that roughneſs and acrimony which conſtitutes this difference. This variation of their taſte, might therefore alone be a ſufficient means of diſtinguiſhing the *fictitious* kind, to any of a nice palate, and accuſtomed to the flavour of the *natural.*

The *Iſlington* water being commixt with brandy, or an infuſion of galls, green tea, *&c.* turns them inſtantly black; but this method of trial yields no other proof, than that thoſe which exhibit this appearance, are really Chalybeat waters of ſome kind or other; but whether formed by *nature* or compounded by *art*, cannot be thence inferred: it being an inſeparable property of all water impregnated with iron, unleſs abounding with ſome acid, to produce this effect. To any, however, who want an univerſal criterion for diſtinguiſhing Chalybeat waters, even though charged with iron only in the minuteſt degree, this experiment, made with a ſolution of galls, will ſupply one; provided care be taken previouſly to examine, that the water in queſtion contain no redundant acid; and that if ſuch be diſcovered, it be duly neutralized by the addition of ſome alkali.

The *Iſlington* water being ſuffered to exhale in the air, or being evaporated to dryneſs by heat, an earthy ferruginous powder is left behind; which will retain its ſolid form, and remain undiſſolved, though any freſh quantities of pure water be added to it: nor when the mixture has ſtood at reſt till the earthy matter be perfectly ſettled, will the clear part of the fluid, if poured off, be found to have contracted either the flavour, or any of the other peculiar qualities of the original water, or at leaſt but in a very ſmall degree. The ſame conſequence will reſult on treating in the ſame manner, the *Tunbridge*, *Spa*, or indeed any other *natural* Chalybeat water, except that in thoſe of the *compound* kind, a ſalt, of which *iron* makes no part, will be found along with the ferruginous earth. This ſediment will be copiouſly depoſited by any of theſe waters, if they be ſuffered to have free communication with the air, even though the quantity of fluid be very little diminiſhed by exhalation during the time. The proportion of iron, the *Iſlington* water contains in dry weather, when it is in full perfection, is about 60 grains in two gallons, as I found by weighing the reſiduum, after a very careful evaporation of that quantity; and what is very extraordinary, this will be found, on computation, to be not equal to one ſeventh of that weight, of which this water is lighter, when compared with common water.

If *oil of vitriol* diluted in water, be added to the ferruginous ſediment, obtained by either of theſe methods, a ſtrong ebullition will immediately follow, the ſediment will be intirely diſſolved, and a ſalt of ſteel produced; which may by the common methods be recovered in a cryſtalline form; or if the mixture be evaporated to dryneſs, the reſiduum will be found rediſſolvable in common water. From whence it is evident, that the ſteel did not *before* ſubſiſt in the form of a *ſalt*, but was combined with the water by ſome medium eſſentially different from the vitriolic acid.

On the commixture of the *Iſlington* water, with a ſolution of fixt alkaline or volatile ſalts, no efferveſcence appears, nor does any turbidneſs or precipitation follow. The ſame holds good of the *Spa*, *Tunbridge*, or any other *natural* Chalybeat water, where the impregnation is *ſimple*; but on thoſe that are alſo *charged with cathartic ſalts*, a *white* turbidneſs ſucceeds, which afterwards forms an earthy ſediment *.

The *Iſlington* water being added to a ſolution of ſope, does not in the leaſt coagulate it, nor make any ſeparation, but unites with it in the ſame friendly manner, as rain or the ſofteſt ſpring water. The *Spa* and *Tunbridge* waters have the ſame quality.—Being mixt with human bile, either when freſh taken out of the gall bladder, or when kept till it be putrid, no precipitation nor change of colour follows: and if urine be ſubſtituted, either in its original or putrified ſtate, inſtead of the bile, the ſame will hold true; and in this alſo, the *Spa* and *Tunbridge* waters agree with it. From hence it appears, that no precipitation or ſeparation of the iron is made, in the bowels *,

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* This experiment, is alone, an infallible method of diſtinguiſhing the natural Chalybeat waters from thoſe which are artificial; as the latter, on the addition of the alkaline ſalts, immediately forms a froth and acquires a green foulneſs: and it is alſo a proper manner of trial, whether any natural Chalybeat water be of the ſimple or compound kind; as the firſt retains its clearneſs after the admixture of the alkaline ſalt, while the other gains a white turbidneſs, according to the quantity of ſalts it contains.

bowels *, from the natural Chalybeat waters; ſince they reſiſt theſe, which have the greateſt power of any of the animal juices in producing ſuch changes.

All theſe obſervations † combine to prove, the *Iſlington* water to be of the true natural Chalybeat kind; as it differs from thoſe of the *Spa* and *Tunbridge* in nothing whatever, but the *degree* of impregnation; which, from an obvious reaſon before alledged, juſtly intitles it to a pre-eminence over them. They tend likewiſe to demonſtrate, that this water is not produced from any ſolution of a martial ſalt; and give thence another experimental argument, (as I ſhall diſtinctly evince below,) that they cannot be the produce of art. There might be many others brought in aid of the ſame purpoſes; but as theſe amount to a valid proof of the points in queſtion, they fully ſuffice: and it only now remains, that I ſhould convey ſuch an idea of the general nature of Chalybeat waters, both *artificial* and *natural*, as may intirely diſplay the reaſons, which warrant the inferences I draw from theſe obſervations; *viz.* that the *Iſlington* water is in all reſpects, except the degree of impregnation, the ſame with thoſe of the *Spa* and *Tunbridge*; and that there is a demonſtrable variation, as well in their qualities cognizable by experiment, as their medicinal virtues, betwixt it and any Chalybeat water which can be formed *artificially*.

By Chalybeat waters are underſtood all thoſe ‡, with which

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* On this quality depends the great medicinal excellence of *natural* Chalybeat waters, as I ſhall below make appear.

† If any perſon be deſirous to repeat any of the experiments referred to by theſe obſervations, I doubt not but he will meet with the ſame indulgence from the proprietor of the wells, which I found.

‡ Some authors have given the name of *Chalybeat* to all mineral waters indiſcriminately; but how abſurd it is to call thoſe *ſteel* waters, which are intirely devoid of ſteel, as is the caſe of many, is too obvious to require the proof of arguments,

which iron is ſo conjoined, as to become a proper and equal part of the fluid. Theſe may be divided into two kinds, *native* and *fictitious* (or *natural* and *artificial.*)—The *native* may be again ſubdivided into *ſimple* and *compound:* the *ſimple* are ſuch, as borrow all their medicinal powers from an impregnation with iron: the *compound* ſuch, as beſides the martial or chalybeat matter, contain a quantity of ſome ſpecies of ſalt, into the compoſition whereof no iron enters, as the *Scarborough* water and many others; and which therefore differ from the *ſimple*, as well in their obvious qualities as medicinal effects.

In order to that combination of iron, and the pure aqueous element, which forms a Chalybeat water, the preſence, and intermediate action of a third body is always neceſſary; for when both are in their *ſimple* ſtate, and freed from all addition, they operate not on each other, nor ſuffer the leaſt change on their being put together; but the water may be poured off, after the iron has been immerſed in it for any length of time, without the leaſt participiation of a *Chalybeat* nature.

The ſubſtances capable, by their addition, of cauſing this combination, are alone ACIDS of the ſeveral ſpecies, and the *phlogiſtic gas* *: when the effect is wrought by the preſence of an acid, a ſaline body is formed by its union with the iron; which ſaline body will always remain behind, and become perceptible, on the evaporation of the water: and if reduced to dryneſs, is capable of a re-diſſolution, or new intimate conjunction with freſh water, without the need of further addition: but from the natural Chalybeat water, no ſalt in the compoſition of which the leaſt iron is found, can be any ways obtained by mere evaporation, only an earthy ſediment is let looſe, as the quantity of fluid decreaſes. The *phlogiſtic gas* is therefore to be neceſſarily regarded, as the cauſe of union here; and the ſingular diminution of the ſpecific gravity of this kind of waters confirms it to be ſo: for it is apparent, from a large field of facts, that all bodies, into the conſtituency of which this ſubſtance enters, in a larger degree, are proportionably light, unleſs where its operation is controlled by the counter-action of acids, which reduces it to the ſtate of a fixt ſulphur, wherein its peculiar powers are ſuſpended. All thoſe various bodies, that we call by the names of *oils*, *ſpirits*, or *eſſences*, (the kinds of acids falſely ſo called excepted) are proofs of this; being lighter than water in the ſame proportion, wherein experience teaches us they abound in phlogiſton. Now, though we may be convinced by a copious and unqueſtionable analogy, that the *mineral* combination of water and iron is owing to this medium,

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* By phlogiſton is meant, in chemiſtry, the inflammable principle or ſulphureous eſſence, that, conjoined with other bodies, renders them capable of feeding or ſupporting fire. Beſides the many other properties, with which this chief inſtrument of nature is indued, it poſſeſſes the power of raiſing ſpecific attractions and coheſions betwixt the parts of bodies of the ſame kind; and alſo, under certain conditions, betwixt bodies of a different genius; nor does it appear from any experiments, that a combination of any two kinds can be made without its intermediation; for even where acids act on bodies of an alkaline conſtitution, the preſence of it appears to be, either in a greater or leſs proportion, neceſſary, as is ſeen in the caſe both of

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of the calcarious and metalic earths. Phlogiſton alone, in the hands of nature, is capable, when fitly conjoined with terrene bodies, to make them unite with water; but where the proportion is inſufficient to this end, the addition of acids muſt, in many caſes, be added to work the effect, and produce an abſolute incorporation of them. In the inſtance of iron, it is particularly *clear*, from many experiments I have made, that there are no *human* means, but the application of an *acid*, nor any *natural* medium, but the preſence of an acid, or of pure phlogiſton in a larger proportion, by which iron can be intimately combined with water.

yet can we not effect the ſame by any means of art; becauſe we cannot procure the phlogiſtic *gas* in that *ſtate of purity*, which is neceſſary to this end: that ſubtle body being ſo active and volatile *, when in a greater degree ſeparated from others, as not to ſuffer itſelf to be confined, but either pervading their junctures or burſting the veſſels in which we would collect it, to elude continually our moſt diligent attempts. And it is therefore impracticable to make a compoſition of water and iron, reſembling in this point of ſpecific gravity to the *native* Chalybeat waters; ſince when acids are employed, the fluid will always be found, inſtead of lighter, to be heavier than common water, in proportion to the impregnation.

The only method therefore of making an artificial Chalybeat water, is by forming in it a *ſalt* of ſteel, by the addition of iron and ſome acid, or by making a dilute ſolution of ſome ſuch ſalt already formed; and by this means a compoſition may be produced, which, in its ſenſible qualities, nearly reſembles the native Chalybeat waters; and will alſo ſtand the teſt of ſome general trials, without diſcloſing any variation from them; but under the queſtion of ſtricter experiments confeſſes a very different nature, and that in points, which alſo prove its medicinal efficacy to be far inferior. But to ſet this matter in the cleareſt light, and ſhew diſtinctly the variation betwixt the two kinds, let us ſearch into the true nature of a Chalbeat water thus formed, by the ſame methods of examination, we before applied to thoſe of the proper native kind.

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* We ſee from the fact above-mentioned, the phlogiſton is ſo extremely volatile, in that ſtate, in which it unites iron and the aqueous fluid, that if Chalybeat waters, when taken out of the well, be not extremely well confined, this active body quits the fluid, and flying off lets the iron immediately disjoin from the water, and fall to the bottom of the containing veſſel.

To form an *artificial* Chalybeat water, the neareſt reſembling the water of the *Iſlington* ſpring, diſſolve ſix grains of ſalt of ſteel in a pint of ſpring water; let the ſolution ſettle, and pour off the clear part from the ſediment, or paſs the whole fluid through a paper filter.

The taſte of this water will be the ſame with that of the *Iſlington* water, excepting an auſterity or roughneſs, which, with ſome, gives a degree of that ſenſation called ſetting the teeth on edge.—Being mixt with brandy, or infuſion of galls, green tea, *&c.* it will, like the other, convert them to blackneſs: and ſo far the two kinds agree with each other. But weighed in the manner above deſcribed, this fictitious Chalybeat water will be found heavier than common water, by three grains in 3840, and conſequently than that of the *Iſlington* ſpring, by about ſixteen.—Being reduced to a ſmall quantity, by evaporation, the ſalt will again ſhoot in ſmall cryſtals; or if it be forced by heat to perfect dryneſs, a white maſs will remain: either of which, being put into a freſh quantity of water, will diſſolve again, and become ſimilar in all reſpects to the firſt.—Being left open to the air, it will yet retain the iron, and continue unchanged in taſte, *&c.*—Being commixt with a ſolution of alkaline ſalts, an effervеſcence will immediately appear, and the mixture will become turbid with a green foulneſs, that will by degrees ſubſide; and the clear part of the fluid being poured off, will be found to be totally deprived of the iron.—Being added to a ſolution of ſope, a coagulum will follow, and the iron conjoined with the oleaginous part of the ſope, will float on the ſurface of the fluid.—Being commixt with animal bile, or urine, a turbidneſs immediately ſucceeds, from a precipitation of the iron; but no change of colour is cauſed, unleſs when the bile or urine uſed are in a putrid ſtate, and then a green or black foulneſs immediately enſues.

From hence it appears, that a fictitious Chalybeat water may be compounded, which correſponds with the *Iſlington* and other *native* Chalybeat water in its ſenſible qualities; and alſo in that property, which ſhews itſelf in the experiment made with brandy, infuſion of galls, *&c.* and eſtabliſhed as the common teſt of Chalybeat waters; but in the inveſtigation of its obſcurer qualities, by a compariſon of its ſpecific gravity, or by a nicer analization, either by heat or the ſeparating power of ſubſtances added, diſplays ſuch as are moſt palpably different. The *Iſlington*, and other *native* mineral Chalybeat waters of the *ſimple* or true kind, are we ſee lighter than common water; but this *artificial* one neceſſarily heavier. In the firſt, the iron, being united with the aqueous fluid by the phlogiſtic *gas*, which when not combined with an acid and rendered a fixt ſulphur, is the moſt volatile body in nature, flies off during the evaporation of the water, or on its being left open to the air, and leaves the iron in its primary and inſoluble ſtate; but to all other methods of analization ſuch water reſiſts. In the other, on the contrary, the union being cauſed by an acid, which has combined with the iron, a ſaline body is formed; and the fluid being diſſipated by heat, leaves behind it not only the iron, but that which is neceſſary as a medium to its conjoining with water; nor does any ſeparation follow, if this fictitious water be expoſed to the open air: but being tried by the addition of the more powerful alkalies, ſuch as a ſolution of lixiviate ſalts, bile, urine, *&c.* the iron is deprived of the acid, and an analyſis is made, which ſoon ſhews itſelf, by the ebullition of the fluid, and the precipitation of the iron.

It is therefore abſolutely certain, that there are the cleareſt marks of a ſpecific difference, betwixt the *Iſlington* water, and any formed by the *artificial* means I have here propoſed, that could be required to convince the moſt ſceptical; and by conſequence, equally certain, that the *Iſlington* water is *not* ſo formed; nor therefore fictitious, unleſs compounded on other principles: and that no other method of conjoining iron and water has been hitherto made known to the world, I appeal to thoſe who are moſt verſed in matters of this kind; and could, were it conſiſtent with the compaſs of this treatiſe, eaſily enforce the arguments already produced on this behalf, ſo as to evince to any one whoſe acquaintance with the ſubject would render me intelligible, that it is highly improbable there ever will. But it certainly ſuffices to the deſtroying ſo groundleſs a falſity, as that reſpecting the ſophiſtication of the *Iſlington* waters, to have ſhewn that it agrees, on the ſtricteſt experimental examination, in all its qualities, with thoſe of the *Spa* and *Tunbridge*; and even poſſeſſes in a highly ſuperior degree, *that* which is the moſt diſtinguiſhing characteriſtic of the true kind of *native* Chalybeat waters. I may add indeed one reaſon, to overthrow this malicious fiction, perhaps of a more popular kind than thoſe I have already advanced: I mean, the abſurdity of ſuppoſing, that a well, which diſcharges at leaſt 888 gallons every day, ſhould be ſupplied by any artifice with the neceſſary ingredients, in ſuch manner as to affect its water, ſo as to make it at all times correſpond in its qualities, under the ſevereſt trials, with the mineral waters of the *Spa* and *Tunbridge*, or any other that flow ſpontaneouſly from the earth. And this conſideration may, perhaps, ſeem to have been alone ſufficient, to have ſuperſeded the neceſſity of all I have ſaid before in proof of the genuineneſs of this water. But ignorance, the common mother of errors, frequently makes a complication of them ſupport each other againſt every effort of reaſon, till the whole body be overcome: and in the preſent inſtance ſhe had prompted ſome, who embraced the miſtake of this water's being medicated by art, to remove that ſenſe of the natural impoſſibility, which loaded their belief of the fact, when they reflected on the copiouſneſs of the effuſion this well continually makes, by ſuppoſing a great quantity of iron has been depoſited in the receſſes of the ſtream, and unites itſelf with the water as that flows over it. A notion not leſs prepoſterous, when the nature of the ſubject is in the leaſt underſtood, than that for which it is brought to account; but feaſible enough to thoſe who are totally unacquainted with every thing of the kind. And it was therefore neceſſary, in order to baniſh effectually this deluſive imagination, and preclude the intruſion of the like for the future, to ſhow, that Chalybeat waters cannot be formed by any ſuch ſimple means; nor at all in any ſuch manner, as that they will, on accurate inſpection, be found to agree in their eſſential qualities, with that of this ſpring, or others which are compounded by the hand of nature.

Having thus I hope fully proved by clear experimental evidence, that the water of the *Iſlington* ſpring is of the true *native* Chalybeat kind, by manifeſting the eſſential difference betwixt this kind and the fictitious; it may not perhaps be impertinent, in order to render this little treatiſe more effectually conducive to the purpoſes for which it is intended, to ſhow, that this difference extends to their *medicinal nature*; and that the firſt are not only preferable, as a far more efficacious remedy, to the latter, but likewiſe to all other *artificial* preparations and forms in which ſteel can be exhibited. To this end, it muſt be premiſed, that no ſubſtance whatever when taken, can be carried into the habit, or act otherwiſe than on the inteſtines, unleſs the ſame be in a fluid ſtate. In order that ſolid bodies ſhould enter into the ſanguinary ſyſtem, or commix with the maſs of blood, it is abſolutely neceſſary they ſhould firſt become a proper part of the chyle; of which, by its totally percolating through the fineſt filter, it appears, that no undiſſolved bodies ever conſtitute a part. The ſolution of ſolid bodies, which fits them to aſſimilate with the chyle, may be either prior to their being taken, or performed in the inteſtines, by ſome of the various juices that are provided to elaborate the digeſtion. But we have before obſerved, that ſteel is inſoluble by any means of art, except the application of acids; and on trying it with bile, the pancreatic juice, or any other humours generated in animal bodies, except the accidental aceſſence of food in the ſtomach, it will be found equally to reſiſt them. It is therefore obviouſly requiſite, in order to make ſteel capable, by artificial means, of paſſing further than the *via prima*, that an acid ſhould be employed, and the ſteel converted to a fluid ſtate; and accordingly, the preparations of it, which practice has adopted, are either the vitriolic ſalt of ſteel;—ſolutions formed by the uſe of the ſpirits of nitre or ſea ſalt;—corroſions made by the addition of *vinegar*, *tartar*, &c.—infuſions in wine, or ſome ſuch parallel methods, in which lies all that art at preſent can pretend to. But the beſt of theſe is far from being a performance adequate to the intention, for though ſteel may be thereby rendered capable of being diſſolved in water, while preſerved from the action of other bodies; yet is this union not proof againſt the analizing power of the bile, but on the commixture of ſuch ſolution with it in the bowels, the ſteel is, for the moſt part, precipitated, and again rendered unfit to paſs the lacteals, and be carried by the chyle into the maſs of blood: eſpecially, if from the concomitant circumſtances of diet, the juices of the *inteſtines* are diſpoſed to a greater alkaleſcence. In the native Chalybeat water, on the contrary, this defect in no degree ſubſiſts; for neither the reſolving power of bile, or the action of any other humour in the body, are able to deſtroy, in the leaſt, the combination of the iron and the water; but remaining ſtill as one homogeneous fluid, the whole commixes perfectly with the chyle, and is carried into the blood without that uncertain diminution or total privation of the iron, to which the *fictitious* Chalybeat water is ſubject. The conſequence of this difference, is apparent in the viſibly ſuperior efficacy, which half a pint of the *Iſlington* water, containing only two grains of iron, has over a doſe of three grains of ſalt of ſteel: and, as well as the theoretic reaſon I have been alledging, proves it to be greatly preferable to any *artificial* preparation of ſteel whatever.

It may poſſibly be expected, I ſhould here give ſome account of the medicinal virtues of the *Iſlington* water; but as the uſe of ſteel as a remedy is at preſent well underſtood; and as I have already ſet forth in what the expedience or advantages of natural Chalybeat waters conſiſt, beyond any other form in which it can be adminiſtered, I think it unneceſſary to expatiate largely on this head. I ſhall, however, for the benefit of thoſe, who may not be able to obtain the advice of regular phyſicians on every occaſion, in a briefer manner enumerate the caſes, in which they may reaſonably hope for relief from drinking it.

In the firſt place, it is of the greateſt efficacy in all nervous diſeaſes, whether in palſies or fits of every kind, or the numerous train of hypochondriac and hyſteric complaints, commonly called *vapours*: and in this intention it reaches all aſthmatic complaints, not proceeding from ulcerated lungs or fluxions on the glands:—the incipient *gutta ſerena* *, and all dimneſs of ſight, not ariſing from an inflammation, a turbidneſs of the humours of the eye or of the cornea, or the decline of years;—all deafneſs not cauſed by obſtructions of the paſſages, or by old age;—as alſo to that general debility or muſcular weakneſs, as well as decay of appetite and failure of digeſtion, which are frequently cauſed by the want of purer air and due exerciſe †. Nor is it of leſs avail in that impaired ſtate of the habit, which is conſequent to the violence of acute diſeaſes; but will be found in theſe caſes, the quickeſt reſtorative of the due animal ſtrength, and juſt tune of the ſolids that medicine can furniſh.

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* The incipient *gutta ſerena*, with all thoſe kinds of deafneſs that ariſe from nervous cauſes, ought undoubtedly to be conſidered and treated as paralytic diſeaſes of the reſpective organs.

† Both the deobſtruent and corroborative qualities of ſteel, render it a moſt powerful remedy againſt all nervous complaints, whether of the paralytic, or hypochondriac and hyſterical claſſes,

It may be eſteemed a ſpecific in all menſtrual obſtructions, whether of the firſt eruption in girls arrived at a mature age, or of the regular returns in adult women; and in all thoſe various diſorders that proceed from this cauſe, as well ſuch as ſhew themſelves under thoſe appearances vulgarly called the *green-ſickneſs* *, as the others, which manifeſt themſelves in a variety of ſymptoms; as acute head-achs; pains of the womb; violent coughs; loſs of appetite; waſte of ſtrength and fleſh; ſlow irregular fevers; hyſteric fits; ſwellings of the legs; inflammatory ſwellings in various parts of the body; breakings out; obſtinate ſores †; and ſometimes gatherings of matter in the lungs.

In dropſies alſo, when taken together with the *ſal* ‡

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claſſes, or, in ſhort, in any kind either of morbid relaxation, or convulſive affections.

* The common ſymptoms of chloretic caſes are ſo univerſally known, that it is needleſs to give any hints for diſtinguiſhing them.

† In other pulmonic conſumptions, perhaps the uſe of ſteel may be liable to objections; as tending to encourage a hymoptuſis; but in the nux vomica, produced by a ſuppreſſion of the catamenia, there is no poſſibility of a cure, except by removing the cauſe: and all other emmenagogues are equally liable to the ſame objection.

‡ The ſal polychreſt and tartar vitriolate, when properly prepared, are in reality the ſame ſalt. But what is at preſent

polychreſt, or *tartar vitriolate*, it will be found of greater avail than any other remedies now in practice; as the benefit received from ſuch a method, is more durable than that which is obtained by the uſe of mercurial or antimonial preparations, or violent draſtic purges: the one operating to a radical cure, by reforming the vitiated ſtate of the ſecretions, particularly of the urinary glands, and reſtoring the depraved tone of the ſolids *; while the other generally proves only *palliative*, by evacuating the preſent collections of the water, and leaving the habit, weakened by the operation, more diſpoſed to a return of the ſame diſorder.

It is of ſignal uſe alſo, as a powerful deobſtruent, in the cure of the ſcrophula or king's evil, and other glan-

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ſold under the name of the tartar vitriolate, contains a large quantity of unneutralized oil of vitriol: an abuſe which has been occaſioned by the chemiſts ſelling, for this ſalt, the reſiduum after the diſtillation of aqua fortis, powdered, without any other preparation; and this has made the redundance of the acid become regarded as a neceſſary quality of this medicine. As this circumſtance, nevertheleſs, makes it very unfit to be uſed in the preſent intention, it is much better to aſk with the apothecaries or chemiſts for the ſal polycreſt; which being prepared in a cryſtalline form, is certain to be duly neutralized.

* It may perhaps be urged, that the drinking the compound mineral waters, which are impregnate both with ſteel and a cathartic ſalt, appears to be equally appoſite to this intention; as both the corroborative and evacuative purpoſes may be anſwered by it: but there are valid reaſons on which I ground my preference of the other method. The firſt is, in order to produce the purgative effect, a large quantity of the *compound* mineral water muſt be taken; which, as I before obſerved, is in ſome degree an inconvenience in all caſes, but in this kind, of the higheſt; as the load water may be very detrimental

glandular obſtructions, and the ſcorbutic, and other diſorders ſpringing from them; eſpecially, if taken along with alkaline ſalts, to attenuate and diſſolve the coagulated and viſcid humours: and by this courſe, I make no doubt, but many of thoſe caſes, which fail of aid from the violent operation of mercury and antimony, and are given up to the mangling offices of the knife and cauſtic, might find effectual relief.

Conſiderable benefit may be alſo had from them, aſſiſted by gentle evacuants, in that unhappy ſtate of the habit, which diſpoſes people to grow fat, and be ſubject to lethargic affections, and ſometimes apoplectic fits.

To conclude, I ſhall add a few remarks on the beſt manner of taking theſe waters, either in general, or in thoſe particular caſes, that require a peculiar management: and this is the more expedient, as an error in that point has been one principal cauſe of their falling into diſrepute: it having been the common practice to take double or treble the quantity proper for a doſe. This has been probably occaſioned, by concluding it requiſite to take the ſame proportion of this water, as is found to be neceſſary of thoſe of the purgative kind, in order to their producing the intended effect; and the miſtake has been frequently the occaſion of their giving ſlight head-achs, and ſometimes a dizzineſs or ſickneſs, to ſuch as were not accuſtomed to drink them. But when the manner is more judiciouſly regulated, theſe inconveniencies may

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trimental, and even ſometimes immediately dangerous; whereas this is avoided, if the purging ſalts be diſſolved in a *ſimple* Chalybeat water, whereof only a very moderate portion is neceſſary: the other is, that the vitriolate tartar is much more diuretic than the ſalts of theſe waters, or indeed any others which have cathartic effects; and therefore much fitter to be joined as a hydrogogue with the ſteel in theſe caſes.

may be intirely avoided; and even a ſenſible benefit and relief obtained from them at the firſt taking.

The doſe in general, ought to be one half pint glaſs, for the firſt three or four times; and increaſed gradually from that to double the quantity; but if this produce any diſagreeable ſymptoms, it ſhould be diminiſhed, till they ceaſe to follow: for it may be taken as an infallible rule, that a leſs proportion, than will continually excite a preſent diſorder, will be ſufficient to work all the good effects on the habit, which may be expected from this kind of remedy. But when taken with purgative ſalts, they may be diſſolved in half a pint of the water, and twice as much may be gradually drunk, after the ſalts begin to operate: for the quantity of water may with ſafety be increaſed, in ſuch caſes, to this degree; as the quick evacuation of it prevents the inconveniencies reſulting from the ſurcharge that ought otherwiſe to be avoided. In dropſical habits, however, it is proper at all times to confine the quantity to a pint, or leſs.

F I N I S.